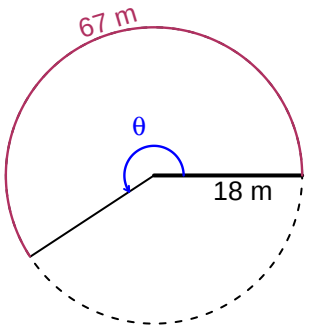
Name: Date:

Trig Final (SLTN v695)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 67 meters. The radius is 18 meters. What is the angle measure in radians?

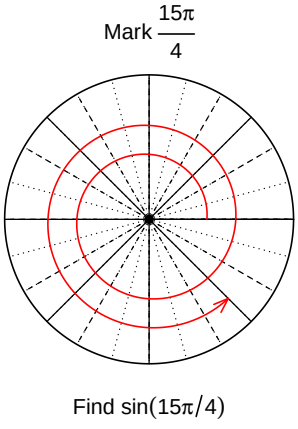


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

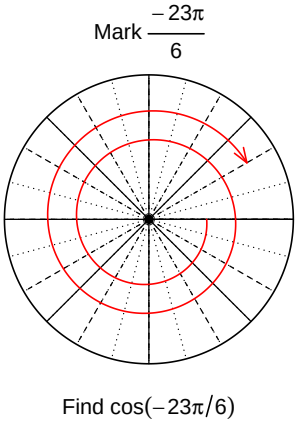
$\theta = 3.722$ radians.

Question 2

Consider angles $\frac{15\pi}{4}$ and $\frac{-23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{15\pi}{4}\right)$ and $\cos\left(\frac{-23\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(15\pi/4)$



Find $\cos(-23\pi/6)$

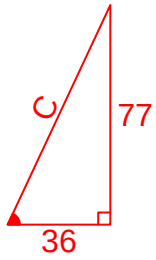
$\sin(15\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-23\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\tan(\theta) = \frac{-77}{36}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

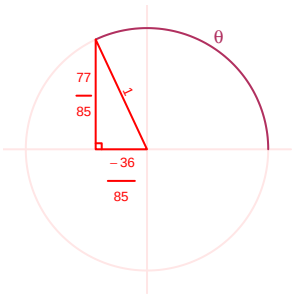
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + 77^2 = C^2$$
$$C = \sqrt{36^2 + 77^2}$$
$$C = 85$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{77}{85}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 7.21$ meters, an amplitude of 8.7 meters, and a frequency of 3.78 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.7\cos(2\pi 3.78t) + 7.21$$

or

$$y = -8.7\cos(7.56\pi t) + 7.21$$

or

$$y = -8.7\cos(23.75t) + 7.21$$